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SOME OFFICIAL AND NON-OFFICIAL IODIDES.

By R. Rother.

For sufficient reasons the *Pharmacopœia* has omitted the submission of processes for the preparation of various official chemicals; hence casual and occasional operators in this line are sometimes dependent on their own resources for the adaptation of formulas suitable to their wants. The origin of the following processes is of this nature:

Plumbic iodide.—According to a formerly official process plumbic iodide was prepared by mixing certain proportions of plumbic acetate and potassic iodide in aqueous solution. The writer has usually employed this process which yields an apparently amorphous lemon-yellow powder. Recently it was noticed that a purchased sample of the iodide possessed an orange tint, together with the peculiar iridescence of the crystalline salt. With a half-inch power it, however, evinced no crystallescence. But this indication is no positive evidence of the total absence of crystals since various amorphous bodies have the capacity of utterly concealing crystalline substances mingled with them. Plumbic acetate does not form a clear solution when dissolved in water alone. Potassic iodide is invariably contaminated with carbonate. Hence these two causes are in themselves sufficient to overcome a moderate tendency to crystallescence or to obliterate such crystals as may form. In order, if possible, to avoid such interference a solution of plumbic acetate, rendered limpid with a little acetic acid, was mixed with a solution of ferric iodide. The resulting precipitate was a mixture of plumbic iodide and free iodine. Plumbic acetate was then treated with ferrous iodide in a similar manner. A lemon-

yellow magma of plumbic iodide was formed. This, after being washed and dried, fell short by about one-twelfth of the amount theoretically required. The powder was neither iridescent or crystalline. When boiled with water the undissolved portion appeared unchanged. The solution gave a large residue of yellow crystals which a half-inch power revealed as a beautiful collection of hexagonal plates and truncated pyramids. The ferrous acetate resulting from the reaction in which this iodide was formed, appeared to exercise no special solvent power since the remarkable solubility of the powder in pure water was very striking. The presence of much acetic acid, however, considerably augments its solution. The simply aqueous solution gives with potassium iodide a faint, white flocculent precipitate. The addition of acetic acid to this mixture produces immediately a more abundant iridescent precipitate of plumbic iodide. The same result is obtained when the potassic salt is added after the acetic acid; an incomparably more intense iridescence results when the iodide of potassium is added in the solid form to the filtrate which contains the resulting ferrous acetate, together with the excess of plumbic acetate and the dissolved plumbic iodide. The profuse precipitate of plumbic iodide when stirred about in the liquid, forms satiny wavy striæ, having a deceptive crystalline aspect. Under the microscope, however, even with a quarter-inch power and higher eye-pieces, the precipitate is amorphous. The results would indicate that plumbic iodide can assume three characteristic states, namely, an extraordinary amorphous and rather soluble form; an ordinary amorphous, and a crystalline form. Whether the iridescent precipitate represents still another distinct form, or is only a mixture of the second and third, cannot be positively stated. The writer believes that the extraordinary amorphous iodide is the proper medicinal salt. The following formula represents its production. The dissolved portion may, however, be separately secured in the ordinary form by the addition of acetic acid and excess of potassic iodide:

Iron in fine wire	240 grains.
Iodine	508 "
Plumbic acetate	757 "
Acetic acid	
Water	of each sufficient.

Upon the iron wire pour three fluidounces of water, add the iodine and shake the mixture at frequent intervals until the iodine is all com-

bined and a light-green solution has resulted. In case the iron wire is extremely fine add the iodine in separate portions shaking the mixture each time until the iodine color is discharged. Pass the solution through a plain filter and follow with water until the whole filtrate measures eight fluidounces. Powder the plumbic acetate, dissolve it in four fluidounces of water and add acetic acid, drop by drop, until the solution becomes limpid. Pass the solution through a plain filter and follow with water until the filtrate measures eight fluidounces. Now pour this solution into the ferrous iodide solution, collect the yellow magma on a plain filter, wash it with water and dry the powder in the open air.

Mercuric iodide.—This salt appears in at least three peculiar states of aggregation. A white extraordinary amorphous salt, usually having but a transient existence almost invariably precedes the generation of the red ordinary amorphous salt. This latter compound is the official form and its preparation offers no special difficulties. A crystalline variety is most readily obtained by dissolving the official salt in a hot concentrated solution of sodium chloride or ammonium chloride and letting the liquor cool. The pharmacopœia states that the official salt is a crystalline powder. That the product as officially prepared is largely contaminated by the crystalline form, cannot be doubted. Such must result from the order of mixing the solutions as officially directed. In this process the first portion formed will naturally dissolve in the excess of potassic iodide, and subsequently separate in crystals as the remainder of the chloride is added. The pharmacopœia also states that the iodide is soluble in solutions of mercuric chloride. This result is also insisted on in various text-books. It is, however, an exaggeration, to say the least, since the addition of only a few drops of the iodide solution causes a permanent precipitate with the whole volume of the chloride solution. A great advantage results from dissolving the mercuric chloride by means of sodium or ammonium chloride. There is also an advantage in the use of ferrous iodide. When a solution of ferrous iodide is poured into an excess of mercuric chloride solution, containing sodium chloride, the ordinary amorphous mercuric iodide results. But in this case a considerable proportion of the iodide is retained in solution by means of an excess of mercuric chloride. The addition of potassic iodide to the filtrate gives an abundant precipitate which exhibits itself in pearly streaks, similar to plumbic iodide under the same conditions. But it rapidly becomes floccu-

lent and ultimately deposits more compactly. With a half-inch power this precipitate is seen to be composed almost entirely of prismatic needles. The writer believes that an amorphous mercuric iodide is the appropriate medicinal form. The following process is suggested to obtain such a product.

Iron in fine wire	240 grains.
Iodine	508 "
Mercuric chloride	541 "
Sodium chloride	240 "
Water, sufficient.	

Pour three fluid-ounces of water on the iron wire, add the iodine at intervals, if necessary, shake the mixture occasionally, until the brown color is discharged, and pass the light green solution of ferrous iodide through a plain filter. Then follow with water until the whole filtrate measures eight fluid-ounces. Powder the mercuric chloride add the sodium chloride, and pour on four fluid-ounces of water, stir the mixture until the salts are dissolved, and pass the solution through a plain filter, adding water until the whole filtrate measures eight fluid-ounces. Now gradually pour the iron solution into this, stirring the mixture meanwhile. Let the precipitate subside, and decant the supernatant liquor. Wash the residuary precipitate three or four times in succession, each time with six to eight fluid-ounces of water, then pour it into a plain filter, and expose the drained precipitate in the open air to dry.

Mercurous iodide.—It is very difficult to prepare this salt in a suitable medicinal form, although the official process gives no such indication; but the process of the pharmacopœia does not yield a desirable product. Elsewhere, November, 1884, the writer suggested a method for preparing mercurous iodide by double decomposition between potassio-mercuric iodide and mercurous chloride. The method is founded on a correct principle, but the practical difficulties presented by the rather coarse crystalline structure of commercial calomel interfere with a necessarily complete interchange of elements. Fownes' Chemistry states that mercurous oxide is readily obtained by treating calomel with solution of potash. The writer, however, found that the structural character also prevents a thorough decomposition in this case. No less than half a dozen repetitions of the process of treatment with potash and nitric acid will suffice for the practically complete conversion of the calomel into mercurous nitrate.

In either case the generated iodide or oxide surrounds the impervious calomel fragments, and thus terminates the progress of the reaction. The pharmacopœia states that calomel is an impalpable powder. The writer finds that the English calomel, which is alleged to be superior to other kinds, feels decidedly granular, and with a half-inch power exhibits a large proportion of transparent crystalline particles. That such must be the case becomes evident from the fact that sublimed calomel has a crystalline structure, and hence any degree of attrition, however extreme, cannot conceal the nature of its pedigree. When precipitated calomel, which is usually amorphous, is employed under these circumstances, perfect double decomposition results, owing to the pervious character of the molecular aggregation. It seems that the only practically available source of amorphously precipitated calomel is mercurous nitrate. This salt is itself rather difficult to prepare in a pure state and of definite composition. Its composition is variously given as $Hg\ NO_3\ Aq$, and $Hg\ NO_3$. The writer prefers employing it in proportion to the molecular weight of the latter formula, as then no objectionable excess would result were it after all composed in this manner.

Mercurous nitrate is prepared by the rather tedious process of dissolving mercury in an excess of moderately dilute nitric acid. It then forms in crystals which decompose in pure water, but readily dissolve in water very slightly acidified with nitric acid. Doubtless a definite amount of freshly precipitated amorphous mercurous chloride prepared by any convenient method would be equally suitable in place of the mercurous nitrate of the following formula:

Mercuric chloride	68 grains.
Mercurous nitrate	262 "
Potassium iodide	166 "
Sodium chloride	500 "
Nitric acid diluted.	
Water	of each sufficient.

Mix the mercuric chloride, sodium chloride and potassium iodide and stir the mixture with sufficient water, gradually added, until the salts are all dissolved. Pass this solution through a plain filter and follow with water until the whole filtrate measures six fluid-ounces. Powder the mercurous nitrate, add four fluid-ounces of water and sufficient diluted nitric acid, drop by drop, until, with constant stirring, a clear solution is obtained. Warm the first solution and gradually add the second whilst stirring the mixture, or mix the two solutions

first and then heat the mixture. When, after sufficient warming, the bright yellow precipitate has firmly subsided, decant the supernatant liquor. Mix the residuary mercurous iodide with four to six fluid-ounces of water, pour the mixture into a plain filter and thoroughly wash the precipitate with sufficient water. Finally dry the powder by exposure, but shielded from strong daylight.

Bismuth-oxyl iodide.—The so-called sub-iodide or oxyiodide of bismuth is attracting some attention. Some difficulties are encountered in the production of a definite salt, having a proper form and appearance. It has been ascertained that the substance should have the composition BiOI, and that it should be an amorphous powder of a light brick-red color. The product usually obtained, although having the desired physical character, is always slightly in excess of the theoretical amount. The excess is about sufficient, in case it were water, to give the body the formula Bi OI. Aq, or Bi $(OH)_2$ I. If however, exposed to a water-bath heat for many hours, it does not lose appreciably in weight. This, however, is no serious evidence against the presence of the elements of water in some state of combination. But the preponderance of evidence seems to indicate that the bismuth-oxyl nitrate has the formula Bi ON O_3 and not Bi O NO_3 Aq. according to the pharmacopœia. It is officially stated to be a heavy, white powder, nothing being said about its more intimate physical structure. When a specimen of one of the most reliable articles in the market is examined under a half-inch power it is found to be wholly made up of stunted needle-shaped crystals. This condition is also possessed by the salt resulting from the writer's process elsewhere published in September, 1884. The success of this method led the writer to apply it in the preparation of the bismuth-oxyl iodide. The peculiar feature of the process consists in generating the oxy-salt in a decreasingly acidine mixture, through the agency of calcium carbonate. When a solution of bismuth nitrate is treated with potassium iodide, either in substance or solution, a seemingly black and bulky bismuth iodide is precipitated. By adding calcium carbonate to a mixture of one m. of Bi I_3 and two ms. of Bi $(NO_3)_3$ the brick-red Bi O I results according to the following equation.

Bi I_3 + 2 (Bi $(NO_3)_3$ + 3 $(CaCO_3)$ = 3 (BiOI) + 3 (Ca $(NO_3)_2$ + 3 CO_2. The presence of acetic acid exerts no solvent power, but appears to be useful, if not essential to the process. The calcium carbonate is not added to total neutrality, but merely in sufficiency to

convert the nitric acid into calcium nitrate. The first addition of the carbonate causes a yellow precipitate, which becomes more and more red with successive additions of the carbonate. When finally all the nitric acid is neutralized the brick-red compound permanently remains. Based upon these conditions, the following process is suggested:

Bismuth-oxyl nitrate	288 grains.
Potassium iodide	166 "
Calcium carbonate	200 "
Nitric acid	360 "
Acetic acid	2 fluid-ounces.
Water sufficient.	

Mix the nitric acid with two fluid-drams of water, and gradually add the bismuth-oxyl nitrate. To the crystalline mass which has resulted, add the acetic acid, and stir the mixture until perfect solution has resulted. Dissolve the potassium iodide in two fluid-ounces of water, and pour the solution into the previous one. To the black mixture add gradually the calcium carbonate. When the reaction is completed incorporate two fluid-ounces of water and decant the supernatant liquor after the red precipitate has subsided; to this residue add two fluid-ounces of water, pour the mixture into a plain filter, and after having thoroughly washed the powder expose it in the air until perfectly dry.

It seems not inappropriate here to remark that bismuth pentoxide or bismuthic anhydrate might perhaps possess antiseptic properties of some medicinal value. The compound is easily prepared as a red-brown powder by treating bismuth-oxyl nitrate with excess of solution of chlorinated soda and washing the precipitate with dilute nitric acid. In this connection the writer would also state that the bismuth when present in solution in very small proportion is readily reduced to the metallic state by a large excess of an ammoniacal solution of ferrous citrate. The reduction takes place in the cold but is facilitated by heat.

When the black bismuth iodide is mixed with solution of potassium citrate a purple-red precipitate remains and acidic potassio-bismuth citrate is dissolved. On setting the liquor aside the acidic salt separates in seemingly crystalline crusts. This residue, when treated with water, again dissolves, but meanwhile gives a mixture which on stirring exhibits the striking pearly streaks already mentioned in connection with other salts. Under the microscope, however, no crystals are visible, but an abundant amorphous matter.

IMPROVED PROCESS FOR MAKING MEDICATED WATERS.

By Richard L. Igel.

The solution of essential oils in water has always been a matter of considerable importance to the pharmacist. To produce a permanent clear and incontaminated *medicated water* and, at the same time, avoid the tedious process of distillation, or other more or less unsatisfactory and troublesome methods, may yet be worthy of the pharmacists' attention.

The objections to the different processess and methods given in books on pharmacy may be summed up as follows:

1. Distillation is in most shops unavailable for want of apparatus, time and experience of attendants.

2. The process with the aid of earth, phosphate of calcium or carbonate of magnesium is the most objectionable, owing to the solubility of these substances in water, no matter how sparingly, thereby contaminating the product. To the careful apothecary this is a constant cause of annoyance in dispensing, as well as in the unsightly deposit it causes on the inside the shop bottle.

3. The use of cotton, although not having any of the above objections, does not yield uniform good results, since the picking of the cotton for the purpose of distributing the oil is tedious, and consequently often done imperfectly, resulting in an opaque product; besides if absorbent cotton be used as indicated the cost of the preparation is likewise to be considered.

The following process I would suggest as an improvement on all the above. It has been used by me successfully for some time, and recommends itself in point of celerity, economy and uniformity and purity of product.

For example to make 2 pints of aqua menthæ piperitæ take a No. 33 filter; lay it upon any smooth clean surface, a light of window glass or a pill tile, drop upon its surface thirty minims (well distributed) oil of peppermint, fold the paper and tear it into small fragments, introduce them into any suitable bottle, add one fluid-ounce of distilled water and shake the contents to a pulpy consistence; now add water, one or two fluid-ounces at a time, two or three times consecutively, shaking well after each addition, then add all or most of the two pints of water and throw the whole upon a filter, using the reserved portion of the water to wash the pulp, and make the product measure two pints.

By using the corresponding shop bottle for the manipulation it serves the additional purpose of cleaning the same perfectly. The filter used for aqua menthæ piperitæ, if carefully dried and preserved, may be used again for the same purpose, etc.

The whole operation, excepting filtering, does not occupy over five minutes time, and the resulting preparation cannot be otherwise than pure. A No. 33 filter has been found sufficient for four pints of medicated water, although more paper may be used to make sure. For aqua camphoræ a solution is first made in alcohol as in the cotton process.

LEAVENWORTH, KAS., July 17, 1887.

ANALYSIS OF BURDOCK ROOT, LAPPA OFFICINALIS, *All.*

BY GUSTAVUS A. WECKLER Ph.G.

(From an Inaugural Essay.)

The root was powdered and contained then 8·21 per cent. of moisture and yielded 3·67 per cent. of ash consisting of salts of sodium, potassium and iron. The result of the proximate analysis may be tabulated as follows:

Extract by petroleum benzin: fixed oil	.400	.400
Extract by ether: fixed oil	.539	
Wax, soluble in chloroform	.011	.550
Extract by absolute alcohol: extractive sol. in water	2.210	
Phlobaphene sol. in ammonia	.075	
Resins	.965	3.250
Extract by water: mucilage, little albumen	4.000	
Sugar (glucose)	5.000	
Extractive matter	8.400	
Inorganic matter	1.200	18.600
Extract by soda: albuminoids	2.720	
Other organic compounds	.200	2 920
Extract by dilute HCl, mostly organic compounds	4.200	4.200
Inulin, cellulin and lignin		70.080

The fixed oil obtained with petroleum benzin was of an orange color, dissolved in absolute alcohol and turned reddish brown with nitric acid.

The ether extract yielded to absolute alcohol an orange-colored fixed

oil, apparently identical with the preceeding; the wax was white, insoluble in petroleum and in alcohol, but soluble in chloroform. The oil saponified with potassa, the liquid becoming reddish-brown and emitting a peculiar potato like odor, the soap after salting out being yellowish and the mother liquid blood red.

The water soluble part of the alcoholic extract was successively treated in both acid and alkaline solution, with benzin, benzol and chloroform, but no indication of an alkaloid was observed. The solution acidulated with sulphuric acid was then neutralized with ammonia, precipitated with three volumes of alcohol and the filtrate tested with reagents for alkaloids without result; nor did the resinous portion of the alcoholic extract yield any alkaloidal matter when treated with dilute acid. The aqueous solution gave with ferric chloride an olive-green color, and yielded with lead acetate a precipitate which after being decomposed by H_2S yielded a soft reddish-brown mass, insoluble in benzin, benzol, ether and alcohol, and not affected by Fehling's test until it had been boiled with dilute sulphuric acid. This behavior indicates the presence of a glucoside.

The water extract mixed with two volumes of absolute alcohol yielded a precipitate consisting of mucilage, some salts and a trace of albumen. The addition of four volumes of alcohol to the concentrated filtrate did not give a precipitate of dextrin; the liquid, however, contained sugar which readily reduced alkaline solutions of cupric oxide. Indications of an alkaloid were not obtained.

The amount of inulin was not determined.

Chloral-hydrate as a vesicant.—Ivanowsky recommends (Vratch, 1886, No. 16) the external application of chloral-hydrate instead of cantharides. The former, he says, is quite as strong a vesicant as cantharides, and has not its disagreeable bye-effects. Finely powdered chloral-hydrate is dusted on an ordinary piece of strapping; on warming this the chloral-hydrate melts; it is then applied to the skin, which should previously have been anointed with oil or grease. Vesication is produced rapidly and nearly without pain and the skin does not suffer as after cantharides. After removing the fluid from the blister the skin appears nearly normal. The chloral plaster ought to be removed as soon as the blister forms, *viz.*, after ten minutes—or at the utmost after fifteen minutes. If left on longer, or if the skin has not been protected by oil, the skin suffers. Deep ulcers, which heal with difficulty, would form if the chloral-hydrate were kept on for an hour.—*Med. Chronicle*, March, 1887.

CYPRIPEDIUM PARVIFLORUM.

By E. S. Beshore, Ph.G.

(Abstract from an Inaugural Essay).

An analysis of the rhizome and rootlets of the above plant gave the following result:

Fixed oil	·48	per cent.
Volatile oil and acid	.02	"
Resin soluble in chloroform, alcohol, etc	1.53	"
Other compounds soluble in ether	.49	"
Glucose	2.34	"
Resin and phlobaphene	3.08	"
Mucilage	3.92	"
Dextrin	.88	"
Saccharose	4.44	"
Albuminoids	6.00	"
Starch	6.56	"
Cellulose and loss	49.15	"
Moisture	12.55	"
Ash	5.98	"
Undetermined	2.58	"
	100.00	"

A peculiar acid was found in the portion soluble in stronger ether, allied to tannic acid but distinct from it, as well as from gallic acid. The extracts which might contain alkaloids were tested with potassium triodide, potassio-mercuric iodide, tannic, picric and phosphomolybdic acids, and auric and platinic chlorides, with negative results, as much as 750 gms. of the drug being used for one series of tests, without giving any alkaloidal result. 700 gms. of the original drug distilled with milk of lime yielded a distillate which had an alkaline reaction, and upon shaking with petroleum spirit yielded on evaporation of that solvent a few yellowish-white crystals, which were sparingly soluble in acidulated water. This solution gave a purple precipitate with auric chloride, a grayish precipitate with platinic chloride, a white one with phosphomolybdic acid and a turbidity with picric acid. In conclusion, the author states as his belief, that there exists no crystalline principle in the plant outside of the volatile constituent, and that only in a very small amount.

PRACTICAL NOTES FROM VARIOUS SOURCES.

By the Editor.

Permanent solution of mercuric chloride.—On dissolving mercuric chloride in other than distilled water, a precipitate of oxychloride is usually produced by the earth carbonates in the water. Prof. O. Angerer (*Centralbl. f. Chir.*, 1887, p. 7), states that Schilling succeeded in preventing this precipitate by the addition of sodium chloride equal in quantity to that of the corrosive sublimate. Schilling prepares also *corrosive sublimate tablets* from 1 gm., or 0.5 gm. each of the two salts mentioned; these tablets dissolve rapidly, and are adapted for distilled or any other pure water.

The facts upon which the above is based, were ascertained in 1857 by Voit (*Ann. Chem. Phar.*, civ. 341) in researches made for an entirely different purpose. He proved the existence of two double salts NaCl. $HgCl_2$ and 2 NaCl.$HgCl_2$, both of which are freely soluble in water, and these solutions if not too dilute, may be rendered distinctly alkaline by caustic soda without being precipitated; excess of soda causes the appearance of a white, then red-brown, etc., precipitate, but this appears later, and is less rich in mercuric oxide, if a sufficient excess of sodium chloride is present.

Almén's test for sugar is a modification of Böttger's test, the reagent being prepared in solution which will keep unchanged for years (*The Lancet*, May 14, 1887). It consists of bismuth subnitrate, caustic soda and potassio-sodium tartrate. In testing for sugar in urine, the albumen, if present, must be first removed by precipitation by heat and acid, and one part of the solution treated with ten of the urine, when, if sugar is present, the bismuth will be deposited in a metallic state. The test is sufficiently delicate to detect sugar in the proportion of only .05 per cent.

Pencils of iodoform.—Two kinds are employed by Poinsot (*Jour. de Méd. de Paris*, March 6, 1887), the soft variety being prepared from equal parts of finely powdered iodoform and gelatin, while the hard pencils are composed of equal parts of iodoform and cacao butter.

Coffee deodorizing iodoform.—Coffee freshly ground has been recommended for disguising the odor of iodoform. Dr. Neale (*Brit. Med. Jour.*, May 21, 1887) states that its effects last only for a limited period, and the coarse particles of the powder are apt to irritate the

sore. These objections are overcome by digesting the ground coffee in melted lard or soft paraffin, which vehicles dissolve the deodorizing principles, and after straining form smooth and unirritating bases for ointments of iodoform.

Manganese biniodide has recently been recommended in medical journals in the treatment of amenorrhœa, given in the form of pills, containing 2 grains each. A formula for the preparation of this so-called biniodide has not been given; very likely the *manganous iodide*, $Mn I_2$, also known as *protiodide*, is intended. This compound is as difficult to prepare and keep in the solid state in an unaltered condition as the corresponding iron compound, and like the latter is best administered in the form of syrup, for which the late Prof. Procter published a good working formula in 1850.

Solution of carbon bisulphide in typhoid fever is recommended by Dr. Dujardin-Beaumetz (*Jour. de Méd. de Paris*, 1887, xii, 194,) to be prepared as follows:

Bisulphide of carbon	25 gm.
Water	100 gm.
Oil of peppermint	30 drops.

This is put into a bottle capable of holding 700 gm. (22 oz.) well agitated and then allowed to settle. Of the clear watery solution from 8 to 12 tablespoonfuls are given during the day, each dose being mixed with a half tumblerful of aromatic water or milk. A quantity of water should be added to the bottle equal to the solution taken by the patient.

Glycerite of resorcin has been used by Dr. H. P. Chase (*Peoria Med. Jour.*, June, 1887, p. 87) in eczema, as follows:

Resorcini	℥ ij
Glycerini, q. s. ad	℥ ij

M. Sig.—Apply with camel's-hair pencil morning and evening.

Paraffin oil in hypodermic injections is recommended by Dr. Albin Meunier (*Bull. gén. de Thér.*, 1887, p. 21). All the hydrocarbons of the marsh gas series are diffusible in the animal tissues, but their diffusibility varies inversely with their consistence. A large number of medicaments have been experimented with; the following formulas show the manner of using the solvent:

1. Pure eucalyptol, 5 gm.; paraffin oil, 20 gm.
2. Eucalyptol, 5 gm.; iodoform, 0·25 gm.; paraffin oil, 20 gm.

Given as injections these solutions are tolerated in doses from 1 to 15 grams per day and even more.

3. Carbon bisulphide, 1 gm.; paraffin oil, 19 gm. Used repeatedly in small quantities, from one to two grams through the day.

4. Pure terebenthene, 5 gm.; paraffin oil, 20 gm. This is tolerated in daily quantities of from 1 to 10 grams.

Some paraffin oils, on being saturated with pure phenol, and moderately heated, acquire a rose color, and form a violet-colored precipitate, which is augmented in the intensity of color on the addition of alcohol. Such paraffin oils should be rejected for hypodermic use. The impure oils are usually colored black in contact with sulphuric acid. (See also AMER. JOUR. PHAR., 1887, p. 349.)

At a meeting of the Paris Société de Thérapeutique, Dujardin-Beaumetz called attention (*Prog. méd.*, Feb. 12, 1887) to the solvent powers of *huile de Bakou*, paraffin oil, and stated that the oil is innocuous, and could be used with advantage subcutaneously as a vehicle for various irritating compounds, the acrid nature of which was thus very materially modified. It dissolves fixed and volatile oils, camphors, benzol, carbon bisulphide, iodoform, iodine, bromine and phosphorus. To be adapted for such use, paraffin oil should not have been treated with sulphuric acid, but should be neutral to test paper, inodorous and tasteless, and should not give off vapors below 180° C.

Adrian (*Les nouv. Rem.*, April 24, p. 171) observed a distinct acid reaction on the treatment with hot alcohol of Russian and American paraffin oils, as well as that prepared from soft paraffin with ether at —10° C. (14° F.) The specific gravities of these oils varied from 845 to 880. To be adapted for medicinal purpose such oils should be colorless, not fluorescent, inodorous, insipid, and of the density 875 to 890; when heated to 50° C. they should not give off the odor of petroleum, and nothing should distil over below 360° C. (680° F.); at —15° C. (5° F.) they should neither congeal nor become turbid; they should not impart an acid reaction to hot alcohol, and when treated with sulphuric acid in a water-bath for 24 hours, should at most produce a light-brown color.

From a paper by Dr. J. Ley, in *Les nouveaux Remèdes*, April 8, it appears that Dr. Balzer experimented in the direction indicated in 1886, and in November communicated his observations to the Société de Biologie. Digitalin, aconitine, quinine and other alkaloids may thus be administered, but require to be dissolved in chloroform or

ether before mixing with the paraffin oil. For various reasons Dr. Ley prefers a vegetable oil as a vehicle for hypodermic injections, and finds that

Purified groundnut oil answers the purpose well. The purification is effected by bleaching in the sunlight, decolorizing with animal charcoal, and sterilizing; it is then an excellent vehicle for volatile oils, iodoform and phenol, and of the latter rather concentrated solutions, —containing from 3 to 10 per cent. of phenol—may be used. The phenol solutions are made with the aid of a moderate heat.

The therapeutic equivalents of quinine salts was the subject of a paper recently communicated to the Paris Société de Thérapeutique by Dr. Boymond. The accompanying table gives in a condensed form much information of great practical value to the pharmacist and physician:

Salts	Percentage of			1 part soluble in water at 15° C.	1 part water dissolves		1 part anhydrous quinine contained in
	Alkaloid	Acid	Water of crystallization		Salt	Anhydrous quinine	
Hydrate	85.72	.....	14.28	16.70	.00059	.00050	1.16
Acetate	84.37	15.63	.....	slightly	.....	.....	1.18
Hydrochlorate	81.71	9.21	9.08	21.40	.046	.0388	1.22
Lactate	78.26	21.74	.....	10.29	.097	.0759	1.27
Hydrobromate	76.60	19.15	4.25	45.02	.022	.0168	1.30
Valerianate	76.06	23.94	.....	53.70	.029	.0220	1.31
Sulphate	74.31	11.24	14.45	581	.0017	.0012	1.34
Sulphovinate	71.20	28.80	.....	3.30	.303	.215	1.39
Arseniate	69.38	15.21	15.41	slightly	.....	.....	1.44
Salicylate	68.79	29.30	1.91	863	.0011	.0007	1.45
Citrate	67.08	19.86	13.06	820	.0012	.0008	1.49
Bromhydrate (neutral)	60.67	30.34	8.99	6.33	.158	.0958	1.64
Sulphate (neutral)	59.12	17.89	22.99	8.81	.113	.0668	1.69
Ferrocyanhydrate	56.25	37.50	6.25	slightly	.....	.....	1.77
Hydriodate, acid	55.95	44.05	.....	.....	.....	.....	1.78
Tannate	22.60	67.36	10.04	800	.0012	.00028	4.42

The figures given above differ to some extent from those adopted by the French, United States, and other pharmacopœias.

Resin of guaiacum is regarded by Sir James Sawyer (*Birmingh. Med. Review*, Jan. 1887) as a valuable emmenagogue in a large proportion of cases of amenorrhœa; it is given in doses of ten grains, stirred in a wineglassful of milk, every morning before breakfast. The ammoniated tincture of guaiacum may be given during the painful period, in certain cases of dysmenorrhœa, in doses of half a drachm to a drachm in a wineglassful of water every two or three hours till the pain is relieved.

ABSTRACTS FROM THE FRENCH JOURNALS.

[Translated for the AMERICAN JOURNAL OF PHARMACY.]

SALICYLATE OF LITHIUM.—M. Julliard, a French pharmacist, finding that his solutions of this chemical soon changed to a dark brown color, investigated the cause of the alteration, which he explains, in the *Bull. Comm.* for June. Of six samples, obtained from large drug establishments, four gave an acid reaction and two were neutral. The latter, which were pure, turned of a dark coffee-color in six or seven days; the four others, which he found to contain salicylate of sodium, were found to be colorless at the end of thirty days. Investigation led to the conclusion that the salicylates of lithium sold to pharmacists contain from 12 to 15 per cent. of salicylate of sodium, which costs about one quarter the price of the lithium salt. He suggests that when pharmacists make solutions of the pure (neutral) salicylate of lithium, they should add a slight excess of salicylic acid in order to render the solutions stable and thus keep them colorless.

LITHIUM PILLS are proposed by P. Vigier, (*L'Union Phar.* June) to replace a similar composition in fluid form recommended by Martineau for glycosuria of arthritic origin. The formula is: Carb. lithium 0·10 gm.; arsen. sodium 3 mgm.; ext. gentian 0·05 gm.; for one pill to be taken night and morning, and continued until the sugar has disappeared from the urine.

QUALITATIVE TEST FOR SULPHITES IN PRESENCE OF HYPOSULPHITES AND SULPHATES.—In treating neutral solutions of alkali sulphites with chloride of barium we obtain a double decomposition: $K_2SO_3 + BaCl_2 = BaSO_3 + 2KCl$, and the liquor, strongly alkaline at first, becomes exactly neutral. If we treat a solution of alkali bi-sulphite in the same way a neutral sulphite of barium is also formed, and half of the sulphurous acid is set free: $2KHSO_3 + BaCl_2 = 2KCl + BaSO_3 + H_2SO_3$. Therefore a mixture of alkali sulphite and bi-sulphite which has a clearly alkaline reaction, will contain free sulphurous acid after the addition of chloride of barium. This suggests a quick method of testing. It suffices to neutralize the mixture of sulphites and hyposulphites by hydrochloric acid, being careful to avoid excess, and to precipitate with chloride of barium. The sulphurous acid will pass over on distilling, and the filtrate may be titrated with iodine.—*Bull. Comm.*, June.

NEUTRAL HYDROCHLORATE OF QUININE has a great advantage

over the basic salt, being soluble in its weight of water, while the latter requires twenty-two times that quantity. To make it, M. Clermont (*Com. Rend.*), dissolves in distilled water, 1 eq. (548 gm.) neutral sulphate of quinine, and mixes this with a solution of 2 eq. (208 gm.) of dried chloride of barium. After separating the sulphate of barium, the liquor is evaporated (below 100°), leaving the solid neutral hydrochlorate of quinine. The solution of this salt is, of course, bitter, but is entirely free from any caustic quality, thus making it as desirable for hypodermic use as it is for delicate conditions of the stomach.

SACCHARATED CASEIN.—M. Léger says further, (See AMER. JOUR. PHAR., 1887, p. 350), that this substance keeps well; at the end of three years a sample exhibited had also lost a portion of its odor. A very small quantity of ol. neroli, added at the time of preparation, completely neutralizes the odor. When allowed to stand, emulsions from the saccharate coagulate like milk, and the coagulum retains the fatty body.

A REMEDY FOR BURNS, proposed by M. Dubois (*Jour. de Méd. de Nantes*), consists in allowing the contents of a siphon of Seltzer water to flow slowly over the affected parts. It quiets the pain almost instantly, and the writer believes it hastens the final cure. He ascribes the good effect to the carbonic acid gas, and to the local lowering of temperature.

RAPID PREPARATION OF COLLODION.—M. Chevreau proposes (*Jour. de Phar.*, June), that the ether be poured first upon the pyroxylin while agitating the mass, and the alcohol added as soon as absorption is completed.

ANTISEPTIC INSUFFLATIONS FOR WHOOPING-COUGH.—According to the *Arch. de Phar.*, July, several practitioners, convinced of the microbian nature of whooping-cough, are using intra-nasal insufflations of antiseptic powders for it. Michael (of Hamburg) recommends powdered benzoin once a day. Moizard uses a powder composed of benzoin and salicylate of bismuth of each 5 gm., and sulphate of quinine 1 gm., three or four times daily. Each naris must be insufflated. A rubber tube is used; the powder is introduced into one end, which is fixed in the naris; the other end is placed in the mouth, and the powder blown to its place.

NAPHTHALIN is said to have been used successfully by Rossbach (*Jour. de Phar. d' Alc-Lor.*), in chronic diarrhœa. Bouchard considers it valuable for obtaining antisepsis in cholera and typhoid fever. It is serviceable in vesical affections when the urine is to be disinfected. In the form of pomade it is used for eczema and psoriasis. It serves

also to replace ac. carbol. in surgical dressings, either as a pomade or as a liquid containing 30 gm. to 1 kilo of alcohol. For internal use, Bouchard recommends this formula: Naphthalin 5 gm.; sugar pulv. 5 gm.; oil of bergamot 2 drops; to make 20 parts, one to be taken every hour. Mâreau recommends that it be taken in gluten capsules containing 0.25 gm. each; they dissolve only in the intestine. See also AMER. JOUR. PHAR., 1886, p. 93, and 1887, p. 128.

THE EXCRETION OF UREA is shown by Chibret (*Comptes rendus*), to be increased enormously by a strictly followed regimen of milk. If this diet be exclusive the augmentation equals 60 per cent. If the regimen consist of one half milk, the increase is 35 per cent. Physicians have been unable to discover the mode of action of this aliment. It would seem that it modifies the composition of the albumen of the blood, and tends to reduce the insufficiently oxidized nitrogenous waste.

LAMIUM ALBUM is thought by Dr. Florain, (*Bull. Gén. de Thérap.*, June 15,) to be fully equal to the *urticeæ* as a hæmostatic. He claims great success with a preparation composed of the tincture, 100 gm., simple syrup 50 gm., and water 25 gm. Dose, a tablespoonful every half hour until the hemorrhage ceases; then, the same dose every few hours. Dr. Florain believes he has separated the active principle of the plant in the form of an alkaloid which he names *lamine*. His method of finding it was to treat 500 gm. of the stems gathered at the time of flowering, with hydrochloric acid and boiling water for half an hour. The liquor was treated with milk of lime and the precipitate extracted with boiling 80 per cent. alcohol. This was filtered and distilled to a syrupy consistence, when it gave, with sulphuric acid, a somewhat abundant white precipitate. This dissolved in boiling water gave, on cooling, long crystals "similar to those of sulphate of quinine." This substance dissolves in boiling water, is less soluble in alcohol, and has a neutral reaction.[1] The alkaloid was given hypodermically, both as a sulphate and a hydrochlorate in somewhat high doses without toxic effects. The hæmostatic effect of the alkaloid was promptly obtained. The writer hopes that analogous researches will be made with *Urtica dioica* and *Urtica urens*.

[1] The process furnishes *calcium sulphate*. The supposed pure alkaloid, obtained by boiling the sulphate with ammonia, is the same salt; it is stated to be a white powder, having a neutral reaction and a slightly saline taste, little soluble in water, and insoluble in alcohol, ether, chloroform, and cold dilute sulphuric acid.—EDITOR AMER. JOUR. PHAR.

NOTE ON A MIXTURE CONTAINING SULPHATE OF QUININE AND BICHLORIDE OF MERCURY.

By T. H. Powell.

The incompatibility of sulphate of quinine and bichloride of mercury is, I think, not very generally known, and was first brought to my notice a few weeks ago when dispensing a prescription, of which the following is a copy :—

Tinc. ferri perchlor.	℥ vj
Quin. disulph.	gr. xlviij
Acid. hydrochlor. dil.	q.s.
Liq hydrarg. perchlor.	℥ iv
Aq. dest.	ad ℥ xij

M.

The quinine (Howard's) was dissolved in the tincture of perchloride of iron and half a drachm of dilute hydrochloric acid added; this was diluted with water, and finally the solution of perchloride of mercury poured in, a perfectly clear straw-colored mixture resulting. After standing a few minutes, however, a heavy granular precipitate began to form, a considerable quantity ultimately collecting at the bottom of the bottle, and remaining undissolved after the addition of a drachm more dilute acid. The same result followed when the mixture was made a second time, the sulphate of quinine being first dissolved in an increased quantity of acid. On examination I found the clear liquid still gave evidence of bichloride of mercury in solution, and the precipitate, as might have been expected, proved to be a double chloride of mercury and quinine. We may perhaps, infer, as the dispenser is directed to use "a sufficient quantity" of dilute hydrochloric acid, that the writer of the prescription was aware of the formation of a precipitate, but believed it was merely due to the inability of the tincture to retain the quinine salt in solution; the addition of the acid, however, does not effect the desired result. I find no mention of the incompatibility of these salts in Squire's 'Companion,' and Pereira merely says a salt of quinine is precipitated on the addition of tannic acid, ammonia, perchloride of mercury and perchloride of platinum, a statement likely to mislead when the character of the respective precipitates is taken in consideration.

I would, therefore, draw attention to the fact that when mercuric chloride and quinine salts are combined in a mixture they form a very sparingly soluble double chloride, which, unless the quantities are

small, will be partially precipitated even in the presence of free hydrochloric acid. The dispenser should therefore direct the bottle to be shaken, for however bright the mixture may be when first made up, a precipitate, dangerous because of its weight, may separate after the lapse of some little time.—*Phar. Jour. & Trans.* June 11th, 1887, p. 1010.

QUININE TESTING.[1]

By Dr. O. Hesse.

The subject of quinine testing has recently been made prominent by the circumstance that the long-known presence of cinchonidine sulphate in commercial quinine sulphate has been again discovered by De Vrij, and an importance has been attached by him to his discovery which it does not possess, and probably will never acquire. But the vehement outcry raised by De Vrij as to this fact, supported by the incorrect results he had obtained by the optical method of testing, has at least had the effect of directing more critical attention to the test of the German Pharmacopœia, the defects of which I had previously pointed out. Though Vulpius some weeks ago expressed the opinion that the problem in question had been solved by means of Schäfer's oxalate test, it is evident, from the fact of Schäfer having very soon supplemented that test by the tetra-sulphate test, which was represented as giving better results than the oxalate test, that it was not altogether free from defect.

In this position of the matter, and in order to satisfy the demands made upon me, it appeared appropriate that I should take up the discussion. But before entering more in detail upon the subject of quinine testing, I think it desirable that I should endeavor to answer the question as to what admixtures of alkaloids may be expected to obtain in the manufacture of quinine sulphate, and to inquire to what extent there may be any justification for the assertions of De Vrij that the therapeutic value of quinine sulphate is reduced by the presence in it of these possible admixtures.

Chemically pure quinine sulphate, free even from hydroquinine, crystallizes in heavy needles, according to my observation. By means of certain mechanical devices it may indeed be obtained in a some-

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[1] From the *Pharmaceutische Zeitung.* Reprinted from *Phar. Jour. and Trans.*, May 28, 1887.

what lighter form, but not of such a light flocculent character as the sulphate usually prepared and answering to the test of the German Pharmacopœia. The light character of the latter is, therefore, due to some other circumstance, and especially to the presence of small admixtures of the sulphates of hydroquinine and cinchonidine, possibly also of hydrocinchonidine and homocinchonidine. The sulphates belonging to the cinchonidine group can be separated from quinine sulphate without interfering with its light form when it happens that there is a sufficient amount of hydroquinine present.

Quinine sulphate does not assume the light character in question as a result of the presence of quinidine or cinchonine sulphates; moreover, it has not the least tendency to crystallize together with either of these salts. It is true, Jungfleisch states that quinine sulphate made from cuprea bark contains quinidine, which separates in crystals when such quinine sulphate is subjected to my test, but so far as my observation goes this statement is not supported by experiment.

Leaving out of consideration for the moment hydroquinine—which, as I shall show in a subsequent paper, approximates very closely indeed to quinine in its chemical nature—as well as the traces of hydrocinchonidine and homocinchonidine that are now and then met with in normal quinine sulphate, cinchonidine is the only adventitious alkaloid that has to be taken into account as being not unfrequently present in large amount in the bark from which quinine sulphate is manufactured. The Ceylon bark, which is now so abundant in the market, is for the most part especially rich in this alkaloid. But notwithstanding this disadvantage, it is still the case that in the old-established quinine factories quinine sulphate that contains only a very small amount of cinchonidine sulphate is made from this bark.

It may indeed be safely assumed that formerly, when the method of manufacture was less perfect than it is at present, quinine sulphate contained a much larger proportion of cinchonidine, although the bark then employed for the purpose generally contained a smaller amount of cinchonidine than at the present time. But even then the amount of cinchonidine was limited by the prescribed method of testing. So far as I am aware, Liebig's test was then most in use, and, as I have shown in another place, it indicates the presence of cinchonidine only when amounting to more than 10 per cent. I, therefore, consider it very probable—and in this respect I agree fully with De Vrij's opinion—that in his time the therapeutic value of quinine

sulphate was ascertained with a salt that contained cinchonidine, and contained at least several per cent. It is, however, now known that cinchonidine acts in the same manner as quinine, if only with one-fourth the potency. If this relation be considered, it must also be admitted that a diminution of the therapeutic value of quinine sulphate, due to the presence of a few hundredths of cinchonidine sulphate, could not be appreciably expressed in figures at all. Consequently, in the case now under consideration, it is not with therapeutic value that we have to do, but it is only the pecuniary question that has perhaps to be taken into account.

This latter consideration, combined with the circumstance that formerly cinchonidine was not separated from quinine at all, was, in fact, the reason for De Vrij's suggestion that the two alkaloids should not be separated, and, indeed, that none of the cinchona alkaloids should be thus separated. As is well known, this opinion led to the discovery of "quinetum." It is true De Vrij defined the idea of quinetum as representing a constant mixture of the alkaloids obtainable from the bark of *Cinchona succirubra* that would always give a rotation equal to $(a)j = -38°$, though in reality it is a "misch-masch" of alkaloids, such as the bark may happen to furnish, and though it is lævogyre, it is not uniformly so. Besides this, the compound of part of such a "misch-masch" of alkaloids with sulphuric acid is prepared and brought into the market as "quinetum sulphuricum." While quinetum itself is a yellow or yellowish-white powder, quinetum sulphuricum is in the form of delicate white needles, and by reason of its great resemblance to quinine sulphate, it is well adapted for the adulteration of that article. This is the preparation that De Vrij on another occasion, in 1877, proposed should replace quinine. It is true that this proposed substitution was, as it appears, to apply only to the case of half-civilized people. To judge from the remarks made by Vulpius in reference to this preparation, it may be inferred that he is not acquainted with its nature, and, therefore, I will give here the results of some analyses of it:

Quinetum:

	1875. Hesse. Per cent.	1879. Oudemans. Per cent.
Quinine	14·96	6·1
Cinchonidine	35·29	22·9
Cinchonine	21·08	37·0

	1875. Hesse. Per cent.	1879. Oudemans. Per cent.
Quinamine	trace	4·5
Amorphous alkaloid	21·06	21·2
Sodium carbonate	—	2·9
Sulphuric acid	1·21	—
Water	6·01	2·7

Quinetum Sulphuricum:

	1875. Hesse. Per cent.	1876. Hesse. Per cent.
Quinine sulphate	14·14	11·91
Cinchonidine sulphate	62·92	61·17
Cinchonine "	22·94	26·92

In another sample of quinetum, Oudemans found only 1·1 per cent. quinamine, but 0·3 per cent. quinidamine and 0·5 per cent. quinidine.

From the foregoing remarks it will be seen that quinine, which chiefly determines the medicinal value of cinchona bark, is present in the preparation called quinetum only in small amount, and that the quinetum sulphuricum which was represented as being directly comparable with quinine sulphate contains no less than about 87 per cent. of the associated alkaloids, and among them about 63 per cent. of cinchonidine sulphate. Closely approximating in character to this latter preparation is the quinine sulphate the English government prepared in their factories in India, containing, according to the data published by Hooper, 40·88 cinchonidine sulphate and 59·12 quinine sulphate; or, as Hooper calculates, 37·55 cinchonidine sulphate and 62·45 quinine sulphate. All this meets with approval from De Vrij.

It is therefore inexplicable to find De Vrij contending that quinine sulphate is depreciated in its therapeutic value by the presence of a small percentage of cinchonidine sulphate, and that for this reason it must be prepared absolutely free from cinchonidine. In any case, such an assertion by De Vrij is unjustifiable so long as he continues to maintain the opposite view as to the above-mentioned preparations and warmly advocates their use.

I completely agree with Vulpius in the opinion that a preparation sent out as quinine sulphate, and to be used as such, ought to contain only a moderate proportion of the associated alkaloids, and it is upon this very ground that I raised objections to the test given in the first issue of the German Pharmacopœia. Subsequently I pointed out how the least trace of cinchonidine could be detected with certainty in

quinine sulphate. On the basis of my long experience of this subject, I proposed to the Pharmacopœia Commission in 1882 not only a test which would without difficulty admit of the detection of a small admixture of cinchonidine sulphate, but also sent a report that was read by the late Professor Fehling at a meeting of the Commission, in which I fully discussed the whole subject, and pointed out the defects of the test in the Pharmacopœia. Notwithstanding this, only Professors Fehling and Otto were in favor of my test being adopted, all the other members preferring to adopt Kerner's test on the recommendation of Professor Flückiger, although I had shown in my report that with quinine sulphate that is not effloresced, or only partially so, a large portion of the cinchonidine sulphate present would escape detection by that test.

In reply to the objection raised by Vulpius to my proposed test, that I desired to pass a less pure quinine sulphate than the Pharmacopœia and the German pharmacists required, I can therefore refer to these facts as proving that his opinion in that respect is entirely unfounded.

The test proposed by me was as follows:

Take 1 gram of the quinine sulphate dried at 100° C., shake it with 20 c.c. of water at 60° C., filter after cooling, and place 5 c.c. of the filtrate in a narrow test tube with 5 c.c. of ether and 5 drops of ammonia solution; close the tube and shake the mixture. The clear ether solution thus obtained should not afterwards deposit crystals. The settlement of the point as to the time to be allowed for such a deposit to take place I left to the Commission; also the decision whether quinine sulphate with two or more per cent. of cinchonidine salt was to be passed.

It will be seen that this test was very similar to that I had previously recommended; it was simply an improvement upon that by which I had done away with defects of which I had become aware by long experience.

The principle on which this test is based is the fact, unfortunately still insufficiently known, that the compound of cinchonidine sulphate with quinine sulphate is decomposed at 100° C., and in a certain way disintegrated, so that the whole of the cinchonidine sulphate present is acted upon and dissolved by the water used. Although in contact with water a partial combination of the associated sulphates may be induced, by far the greater part of the cinchonidine sulphate passes

into solution, while the quinine salt remains almost entirely undissolved. If it were possible to leave the quinine salt completely undissolved there would be no reason to fear any loss of cinchonidine sulphate, but some of the quinine sulphate is dissolved at 60° C., and thus opportunity is afforded for a small portion of the dissolved cinchonidine salt to form a certain quantity of a double compound, which is afterwards deposited in amount corresponding to its solubility. Thus it happens that the whole of the cinchonidine is not obtained in solution in such an experiment. But in any case such a mode of extraction is more complete than when the sulphate is boiled with water, or dissolved in boiling water, since in the latter case there will be not only a decomposition of quinine sulphate attended with elimination of quinine (which can be extracted by benzol), but since a greater part, and perhaps the whole, of the quinine sulphate will then pass into solution, a larger portion of the cinchonidine sulphate will again become latent from formation of the double salt when crystallization takes place. For this reason I cannot approve of the modification in my original test which Schäfer suggested, nor can I confirm the condemnation that he pronounces upon all tests which do not involve a complete solution of the whole of the quinine sulphate during the operation, though I admit that by complete solution of the material tested mixed crystallizations may be placed on the same level as artificial mixtures. This latter result may, however, be obtained simply by allowing the mixture to effloresce at a moderate temperature.

In reference to the other tests that have recently been proposed, that of Kremel may be mentioned as very delicate, but, like other titration methods, it has the disadvantage that it must necessarily be assumed that the substance examined actually contains the constituent that is to be determined by the operation. This condition cannot be ensured in the case now under consideration; consequently that method of testing is inapplicable quite independently of the circumstance that when the commercial quinine sulphate containing cinchonidine sulphate is heated with hot water, as Kremel directs, a solution is not unfrequently obtained on cooling which does not contain the sulphates in question in the same proportions as water solutions of each of them separately would do.

The bisulphate test, recommended by De Vrij, has a sounder foundation, and it yields very good results when it is carried out with the

modifications I have suggested. It requires, however, the use of very pure ether, as is, indeed, the case with every form of cinchonidine determination that is carried out with ether. The modification of this test introduced by Schäfer is less to be relied upon, probably because the evaporation of the ether solution is attended with such a concentration of the quinine as to have the effect of hindering the crystallization of the alkaloid or its compound. It may be for this reason that Schäfer was unable to obtain crystals of "cinchonidine" in operating upon quinine sulphate known to contain 2 per cent. of cinchonidine sulphate. I have no hesitation in affirming that the crystals obtained by the bisulphate test, as modified by Schäfer and described by him as "pure cinchonidine," are a compound of quinine with two molecules of cinchonidine. As I have shown on another occasion, this bisulphate method always gives a cinchonidine result that is too high in the case of a sample containing only a small amount, and with one containing a larger amount the result obtained is too low. On the whole, however, the results obtained by this test are very satisfactory, and they are obtained with one operation, while the recrystallization test, recommended by Dr. Paul, appears to require several successive operations.

It is well known that Paul was the first to direct attention to the occasionally considerable amount of cinchonidine sulphate in the quinine sulphate of commerce. His method of ascertaining the amount of this impurity consists in dissolving 5 grams of the salt in question in 150 c.c. of boiling water and, after cooling the solution, treating the mother-liquor thus obtained with ammonia and ether. The recrystallized sulphate is to be again treated with 100 c.c. of boiling water, and the mother liquor, obtained after cooling, subjected to treatment with ammonia and ether, this operation being repeated until no more crystals are deposited from the ether solution thus obtained. These crystals, however, are not pure cinchonidine, but the compound already mentioned. Consequently the amount of cinchonidine indicated by weighing them is too high by the amount of quinine they contain. If the mother-liquors were treated with ether direct this surplus would be to some extent reduced by the circumstance that it would not then be possible to obtain the whole of the cinchonidine in a state for weighing. But if the mother-liquors are concentrated by evaporation so as to allow of less ether being used, satisfactory results are readily obtained. The mode of procedure I adopt in applying this test is to

dissolve 5 grams of the sulphate in question in 150 c.c. of boiling water, and after the cooled solution has crystallized the mother-liquor is separated by filtering with the aid of suction. The partially-dried residue left on the filter is then boiled with another 120 c.c. of water, and this operation is repeated as often as may be necessary for removing the whole of the cinchonidine. In the case of a salt containing 5 per cent. cinchonidine sulphate at least three such operations will be requisite, and a salt containing 9 per cent. will require at least five recrystallizations. The mother-liquors obtained in the first three operations are then mixed together and evaporated at a moderate heat almost to dryness; the saline residue is dissolved by a few drops of dilute sulphuric acid, and the solution, made up to the volume of 20 c.c. by addition of water and ammonia solution, is shaken with 16 c.c. of ether. After the lapse of twenty-four hours the crystals that may have separated from the ether solution are collected and weighed. The mother-liquors from subsequent recrystallizations are evaporated separately to the volume of about 8 c.c., and after being shaken with ammonia and 2 or 3 c.c. of ether they are left at rest for twenty-four hours for the separation of crystals.

For the purpose of comparing the results obtainable by this method of recrystallization, and by the bisulphate method of testing, the following experimental data are given. No. I. was an old sample of French manufacture, which would not stand the test of the present German Pharmacopœia, and No. II. a sample of German make, which just passed that test, and therefore contained an amount of cinchonidine sulphate that was within the limits allowed:—

Bisulphate Test:

	Crystals.		Cinchonidine sulphate. Per cent.
I.	0·534	=	8·94
II.	·302	=	5 09

Recrystallization Test:

	Mother-liquors.					
	1, 2, 3.	4.	5.	6.		
	Crystals.				Total.	Cinchonidine sulphate. Per cent.
I.	0·505	0·046	0·007	0 =	0·558 =	9·34
II.	·262	·015	·0		·277	4·64

From this comparison it appears that both methods of testing furnish results which agree in a satisfactory manner, and consequently it

is optional which mode of testing is applied for ascertaining the amount of cinchonidine sulphate in the quinine sulphate of commerce.

I may mention here that the compound of quinine and cinchonidine obtained in applying the bisulphate test to commercial quinine sulphate will also contain hydroquinine, and probably also in some cases hydrocinchonidine and homocinchonidine in small proportions, so that if the crystals separated were tested for quinine by the optical method it would give results decidedly too low. This is less to be feared with the recrystallization test, because hydroquinine, which has the greatest influence on the result of the optical test, would not be concentrated in the mother-liquors.

De Vrij's bichromate test is quite unsuited for the quantitative determination of cinchonidine, though it admits of its presence being detected when it amounts to only 0·3 per cent. The reason of this is that as the amount of cinchonidine increases, more or less of it is precipitated with the quinine chromate. It is probably on this account that in applying the test to a sulphate containing 2·7 per cent. cinchonidine sulphate, as Schlickum recommends, I did not obtain immediate indications of the presence of cinchonidine, and only a few crystals were formed after the lapse of an hour. The crystals obtained by this test also contaiu quinine, and are a compound of quinine with seven molecules of cinchonidine.

This is also the case with the oxalate test, and what Schäfer originally took for pure cinchonidine contains quinine, as he has since admitted. The amount appears to be considerable, as I infer from the fact that when dissolved with excess of sulphuric acid the solution has a strong fluorescence, and it becomes intensely green when mixed with chloride of lime and ammonia.

According to the directions for applying this test the precipitate formed on adding soda solution to the filtrate from the quinine oxalate is not to be collected until after twelve hours, and for each 100 c.c. of liquid an addition of 0·04 gm. is to be made to the weight of the precipitate as a correction for the cinchonidine remaining in solution. When the amount of cinchonidine exceeds 4 per cent., the addition is to be 0·066 gm., and the concentration of the solution must be kept to 1 in 50.

Objection has been made from several quarters to this test that too little potassium oxalate is used for precipitating the quinine. But that is not the case, for normal potassium oxalate has only one mole-

cule of water, and with quinine sulphate containing 15 per cent. water 0·42 gram oxalate would be requisite, or with completely effloresced sulphate 0·47 gm.

Another defect of the oxalate test is in the direction as to time. With 60 c.c. of liquid half an hour is not sufficient for obtaining a temperature of 20° C. throughout the whole mass, and this is still more the case with larger quantities. For this reason I have always allowed one hour.

Quinine oxalate is, as Schäfer states, almost insoluble in the presence of potassium oxalate, while cinchonidine oxalate is readily soluble. When a cold saturated solution of quinine oxalate is mixed with the proper quantity of potassium sulphate and an excess of potassium oxalate, the quinine oxalate is at once separated so completely that caustic soda gives no precipitate in the filtrate. On warming the oxalate dissolves, but it separates again completely on cooling. If, however, one per cent. of cinchonidine sulphate be added, and the liquid again warmed, a very much smaller quantity of quinine oxalate separates on cooling than in the former case, showing that the presence of cinchonidine exercises a solvent influence on the quinine oxalate. It is evident, therefore, that in operating upon a mixture a certain portion of quinine remains in the mother liquor, and consequently the precipitate produced in such a solution by caustic soda is not pure cinchonidine. Moreover, cinchonidine is precipitated with the quinine oxalate, and in both cases the proportions thus escaping separation appear to be determined by accidental conditions. Hence it is not possible to estimate from the precipitate produced whether the cinchonidine salt amounts to 2 per cent. or only 0·5 per cent. without a quantitative determination.

Assuming that in operating upon quinine sulphate containing 0·5 per cent. cinchonidine salt, the precipitate obtained after twelve hours is 0·001 gm. (it is really rather more) the addition to be made to this for 60 c.c. of solution would be 0·024, and the 2 gm. would accordingly appear to contain 0·025 of pure cinchonidine, or 1·685 per cent. of sulphate, at least three times as much as the salt actually contained. A direct experiment under these conditions gave 1·77 per cent. The result is still more unsatisfactory when the amount of cinchonidine salt is larger, and the concentration of one to fifty has to be kept to. In operating with a mixture of 1·875 of quinine sulphate and 0·125 cinchonidine salt, corresponding to 6·25 per cent., the result

obtained showed 9·22 per cent., or nearly 3 per cent. more than was really present.

If such known mixtures give differences of this kind, little is to be expected of this test when applied to commercial quinine sulphate, as will be seen from the following results with the sulphate above mentioned (II) which gave—

	Bisulphate test.	Crystallization test.	Oxalate test.
Cinchonidine sulphate.....	5·09	4·64	10·22

Evidently, therefore, the oxalate test is not less defective than the optical test in giving too high an indication of the amount of cinchonidine salt.

It has already been mentioned that the sample II containing 5·09 per cent. cinchonidine just passed the test given in the second edition of the German Pharmacopœia. With another sample I found that this test passed 7·2 per cent. On a former occasion, in testing according to my optical test a sample which only just passed the test given in the first edition of the German Pharmacopœia, my results in two experiments showed 12·92 and 13·02 per cent. cinchonidine sulphate, which appeared so questionable that I made further experiments with the bisulphate method and the tartrate method (Oudeman's optical test), and found by the former 8·46 per cent., but by the latter 15·7 per cent. cinchonidine sulphate. The cause of this high result—not altogether due to the presence of hydroquinine—was not clearly ascertained, but the experiment gives another illustration of the untrustworthy nature of the tartrate method.

THE DISTRIBUTION OF SAFROL.

By Professor Flückiger.

The prevailing constituent of the essential oil of sassafras root is *Safrol*, as will be seen in the text-books; for instance, in 'Pharmacographia,' second edition p. 536. In the crude oil, safrol is held in solution by the hydrocarbon safrene, $C_{10}H_{16}$, and may be separated either by fractional distillation or by cooling the oil. Safrol liquefies at 12° (53°·6F.) and yields very large and fine prisms, which I caused to be exactly investigated crystallographically by Professor Arzouni, as mentioned in 'Pharmacographia.' The large crystals of safrol are very little softer than those of gypsum. Although they cannot be kept at a temperature exceeding their melting point, they

were, curiously enough known in England a century and a half ago.

As to the constitution of safrol it has been shown by Eykman[1] that by means of permanganate of potassium it yields piperonylic acid—

$$C_6H_3\left(\begin{smallmatrix}O\\O\end{smallmatrix}> CH_2\right)COOH,$$

safrol, therefore, may be represented by the formula—

$$C_6H_3 \begin{smallmatrix}<\begin{smallmatrix}O\\O\end{smallmatrix}> CH_2:\\ \diagdown C_3H_5\end{smallmatrix}$$

Piperonylic acid is obtained by oxidizing piperonal (now known, in perfumery, under the name of heliotropin)—

$$C_6H_3\left(\begin{smallmatrix}O\\O\end{smallmatrix}> CH_2\right)CHO$$

and Poleck[2] thinks that he has observed piperonal among the products of the treatment of safrol with permaganate of potassium, for the action of this salt on safrol is by no means very simple, 4 per cent. of piperonylic acid only having been obtained by Poleck.

Sassafras is not the only plant containing safrol. In the same natural order *viz.*, that of Lauraceæ, *Mespilodaphne Sassafras*, Meissner, a Brazilian tree, has a bark resembling safrol in odor. The same is also well known with regard to the Puchury nuts, or sassafras nuts, the cotyledons of two Brazilian species of Nectandra, a genus as yet very imperfectly known.[3]

Again, the order of Monimiaceæ, tribe Atherospermeæ, closely allied to Lauraceæ, would appear to be provided with safrol. Of this at least the aroma of the Australian 'sassafras bark" is strongly suggestive. This drug, which is not seldom seen in the London market, is the bark of *Atherosperma moschatum*, Labillardière, a tree indigenous to Australia and Tasmania. The bark of *Doryphora Sassafras* of New Caledonia, likewise of the order of Monimiaceæ—Atherospermeæ, also smells of sassafras.

Although there can be but little doubt as to safrol really occurring

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[1] *Recueil de travaux chimiques des Pays Bas*, iv. (1885), 32, according to the "Referate" of the *Berichte der Deutschen Chemischen Gesellschaft*, Berlin, 1885, p. 281.

[2] *Berichte der D. Ch. G.*, 1886, 1096.

[3] See 'Pharmacographia,' 540. The statement found there to the effect that *Oreodaphne apifera* yields also an oil of the same odor is not correct, as I was informed in 1881 by a kind note from Mr. Holmes. "Aceite de Sassafras," from *Nectandra Cymbarum*, Nees, probably contains safrol.

in all those essential oils of the just-named plants the fact has not yet been proved.

This, however, has been most surprisingly done by the well-known house of Schimmel & Co., of Leipzig, with regard to the oil of the camphor tree *Cinnamomum Camphora.* Since 1885 the said house is manufacturing safrol from camphor oil to a very large extent. No doubt there is now much more safrol being made in the state of absolute purity at Leipzig than they are able to distil crude oil of sassafras in the United States.

Cinnamomum Parthenoxylon, Meissner, and *C. glanduliferum,* Meissner, the former tree belonging to the forests of Penang, Sumatra and Java (Kayu-gadis of the Malays), perhaps also in Tennasserim; the second in Nepal, Sikkim, Bhootan and Khasia ("Sassafras of Nepal"), are also known for their odor resembling that of true sassafras.[1] They would deserve a chemical investigation.

I am struck, lastly, with the very strong odor of the same kind displayed by the bark of an Australian tree, which has been described by Bentham (assisted by Ferdinand Müller) in the 'Flora Australiensis,' vol. v. (1870), p. 299, under the name of *Nesodaphne obtusifolia.* It is a large and handsome tree, growing in Queensland, Rockingham Bay, Fitzroy River, Rockhampton, Archer's Creek (according to Leichhardt), also in New South Wales, Clarence River. Hooker and Bentham, 'Genera Plantarum,' iii. (1880), p. 152, ultimately unite the genus Nesodaphne to Beilschmiedia;[2] the tree under notice is, therefore, to be called *Beilschmiedia obtusifolia,* Benth. and Hook.

Dr. Joseph Bancroft, in his 'Contributions to Pharmacy from Queensland' (Colonial and Indian Exhibition of 1886, London), p. 11, states that the tree grows in the rich scrubs to the north of Brisbane. Its grey, rough bark, reddish-brown internally, has a strong aromatic odor and pleasant astrigent taste, and is frequently used by bushmen to improve the flavor of their tea. The bark, according to Mr. Staiger, affords about 2 per cent. of volatile oil heavier than water,[3] and 9 per cent. of tannin.

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[1] Waring in 'Pharmacopœia of India.' London. 1868, 196.

[2] A genus of the order Lauraceæ-Perseeæ, devoted by Nees to the Pharmacist Karl Traugott Beilschmied (1793–1848), of Ohlau, Silesia. See *Archiv der Pharmacie,* cviii. (1849), p. 126.

[3] Specific gravity of safrol = 1·114 at 0° (32° F.)

Being indebted to Mr. E. Merck of Darmstadt, for a good sample of the bark of *Beilschmiedia obtusifolia*, I may state that it agrees to some degree, in its microscopic structure both with the bark of cassia lignea and sassafras. The Beilschmiedia bark is as much as 15 millimetres (half an inch) in thickness, and shows the same exfoliation due to secondary cork bands (rhytidoma) as the bark of sassafras. Beilschmiedia bark is, on the other hand, much more fibrous than either of the above-named barks; its tissue being very rich in long thin fibres, and in its outer layer there are scattered, not in large number, sclerenchymatous cells, having comparatively thin walls. The oil ducts of Beilschmiedia bark are neither very numerous, nor considerably large. It remains to be proved that they really contain safrol as I venture to say.

In the natural system, the Magnoliaceæ are not much distant from both Lauraceæ and Monimiaceæ. Eykman has shown,[1] that safrol also occurs in the essential oil of the fruit of *Illicium religiosum*, the false star-anise of Japan; this tree belongs to the order of Magnoliaceæ. There the safrol is accompanied by eugenol, the formula of which

$$C_6H_3\begin{cases}C_3H_5\\OCH_3\\OH\end{cases}$$

at once reveals its relationship to safrol as also to anethol—

$$C_6H_4\begin{cases}OCH_3\\CH=CH-CH_3\end{cases}$$

It would appear, therefore that at least eugenol $C_{10}H_{12}O_2$ and safrol $C_{10}H_{10}O_2$ may be in some generic relation. The former has been met with by Stenhouse in the leaves of the cinnamon tree.[2] And, thirdly, anethol $C_{10}H_{12}O$, the chief constituent of the oil of true star-anise, *Illicium anisatum*, is there replacing safrol as occurring in the other variety.

It would be interesting to be able to convert one into the other of those three highly aromatic substances; their empirical formulæ: $C_{10}H_{12}O$, $C_{10}H_{10}O_2$. $C_{10}H_{12}O_2$ would apparently indicate the probability of such transformations, but not their structure—*Phar Jour. and Trans.* June 4th, 1887, p. 989.

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[1] *Pharm. Journ.*, xv. (1885), 985, short abstract of Eykman's paper in the *Recueil*, above mentioned.

[2] 'Pharmacographia,' 527.

ON NAPHTHALOL.

By R. Kobert.

Salol, introdueed by Nencki, (see Am. Jour. Phar. 1880, pp. 380, 552,) is rather poisonous, because it contains 38 per cent. phenol. Merck has prepared a substance of the formula $C_6H_4OH\ CO\ OC_{10}H_7$, named naphtalol or naphtolsalol. It is an ether-like compound like ordinary salol; instead of the poisonous phenol it contains β-naphthol, which is relatively non-poisonous. Kobert has made experiments with it on animals and man, to determine its physico-chemical behavior and its effect on the digestive ferments. He has arrived at the following conclusions:—

(1) The drug is insoluble in water, odorless, tasteless; it is not dissolved or decomposed by acids, gastric juice, nor by pepsin.

(2) It is quickly decomposed by the pancreatic and other ferments which are produced by the living mucous membrane of the small intestine, as shown by experiments on rabbits, dogs, calves, oxen, rats, and sheep. Phenolsalol, according to Nencki, is decomposed by the pancreas.

(3) The mucous membrane of the cœcum and vermiform process of animals acts on the drug in a similar manner.

(4) The mucous membrane of the colon also decomposes it, although to a less extent.

(5) The stomach is not affected by the drug.

(6) Doses of ·3 to ·5 gr. daily cause no disagreeable general symptoms, no noises in the ear, fullness of the head, and such as are occasionally produced by the phenolsalol.

(7) In man, naphtholsalol after administration by the mouth appears in the urine in the same form as salicylic acid, viz., as a body which becomes of a violet color in contact with perchloride of iron.

(8) No symptoms of poisoning were observed, even after several weeks' administration of the above-mentioned doses.

(9) Animals can bear much larger doses without the general condition being injuriously influenced. A hen was not ill after having three grains within two days.

(10) The drug was found very useful, and at least as valuable as other medicaments, in various forms of catarrh of the bladder, especially in gonorrhœal cystitis, with alkaline decomposition of the urine. The urine soon became clear and acid, the formed elements in it were diminished in number, and the pains of the patients became easy.

(11) The drug seems to be borne as well and acts better than phenolsalol in acute articular rheumatism.

(12) The further use of naphtholsalol in various forms of decomposition in the intestine seems quite feasible.

(13) Small qnantities of naphtholsalol do not permanently protect urine, meat infusion, and foul-smelling fluids against decomposition as phenolsalol does. For urethral injection the latter, therefore, is to be preferred. The advantage of naphtholsalol consists chiefly in its relative non-toxicity when used internally. Willenz will publish details in his inaugural dissertation.—*Med. Chronicle* 1887, p. 304; *Ther. Monatshefte*, May.

VEGETABLE GLOBULINS.

By S. H. C. Martin.[1]

Vegetable globulins can be divided into two classes, namely, vegetable myosins and vegetable paraglobulins. The myosins, obtained from the flour of wheat, rye, and barley, have similar properties; they are all readily soluble in 10—15 per cent. sodium chloride solution, and are precipitable from this solution by saturation with sodium chloride or magnesium sulphate. They are soluble in 10 per cent. magnesium sulphate solution, and are coagulated in this solution at a temperature of 55—60°. If the salt is dialysed away from the saline solution of myosins, the latter is precipitated; but the precipitate is no longer a globulin, since it is insoluble in saline solutions. It is soluble in dilute acids and alkalis (0·2 per cent.); it is precipitable from these solutions by neutralization, the precipitate being soluble in excess of alkali or acid; that is, the myosin has been converted into a proteïd, having the properties of an albuminate. If the saline solution of myosin be placed in an incubator at a temperature of 35—40°, in 12 to 18 hours a fine flocculent precipitate falls, while the globulin disappears from the solution; this takes place more rapidly if the saline solution is diluted. The precipitate exhibits the same properties as the precipitate of the globulin by dialysis; that is, at a temperature of 35—40° the globulin is transformed into an albuminate. The ready transformation of the soluble globulin of wheaten flour into an insolu-

[1] *Proc. Physiol. Soc.*, 1887, 8—9. Reprinted from *Jour. Chem. Soc.*, May 1887, p. 507.

ble albuminate is one of the phenomena which takes place during the formation of gluten.

The second class of vegetable globulins, the paraglobulins, is in distinct contrast with that of the myosins. Two proteïds of this class have been found, one in papaw juice, the other in the seeds of *Abrus precatorius* (jequirity). Both these globulins exhibit the following properties: they are soluble in saline solutions, and are precipitated by saturation with sodium chloride and magnetium sulphate. In a 10 per cent. solution of magnesium sulphate, they coagulate betweeu 70° and 75°. When precipitated from their saline solutions by dialysis, they are still soluble in solutions of sodium chloride and magnesium sulphate of 10—15 per cent., not being transformed into albuminates. Nor are they precipitated by long exposure (over three days) to a temperature of 35—40°.

CHARACTERISTICS OF OLIVE OIL.

A. Levallois (*Compt. rend.*, civ, 371—373), has examined a large number of genuine samples of olive oil from the olive yards of the south-east of France.

The color of the oil was determined by means of a Duboscq colorimeter. The color at the commencement of a crop is 70 times as intense as at the end. The sp. gr. at 15° varies from 0·9167 to 0·9177, and the differences observed with different species are only very slight. The sp. gr. of olive oil at 24° is 0·911, whilst that of other oils at the same temperature is as follows:—

Sesame	0·917	Colza	0·910
Cotton-seed	0·9165	Camelina	0·920
Earth-nut	0·912	Linseed	0·928
Poppy	0·9205		

The sp. gr. of colza and earth-nut oil are somewhat near that of olive, but their other properties make it easy to distinguish between them.

Cailletet's reagent (nitric acid saturated with nitrogen oxides) usually gives a green coloration, which, however, is not always pure, but is sometimes mixed with yellow.

Audoynaud's reaction (addition of nitrosulphuric acid and ether to a mixture of the oil with potassium dichromate) usually gives a green coloration, which in some cases is mixed with yellow.

The determination of the non-saturated fatty acids by treating the non-saponified oil with bromine or iodine gave no concordant results. The following method is satisfactory :—5 grams of the oil are weighed into a test-tube about 15 cm. long and 15 mm. diameter, mixed with 10 cc. of a 20 per cent. solution of potassium hydroxide in alcohol of 93°, and agitated, when the oil dissolves. The liquid is then heated on a water-bath to a temperature sufficient to produce gentle ebullition, and after about 15 minutes saponification is complete. The volume of the liquid is then made up to 50 cc. by adding alcohol, and 5 cc. of the solution is placed in a tube provided with a glass stopper, acidified with hydrochloric acid, and then mixed with a concentrated aqueous solution of bromine from a burette, with vigorous agitation, until the liquid acquires a persistent pale-yellow tint. About 0·1 cc. of solution is required to produce the end reaction, and this should be substracted from the total volume added. The bromine is standardized by means of a decinormal solution of arsenious acid, mixed with hydrochloric acid. Different samples of oil from the same species of olive absorbed from 0·512 to 0·522 gram of bromine per gram of oil. The absorption by oil from different species of olive varied from 0·500, to 0·544, the last result being obtained with oil from Blanquetier which also has an exceptionally high sp. gr. The amount of bromine absorbed by 1 gram of other oils is as follows :—

Cotton-seed	0·645	Colza	0·640
Sesame	0·695	Camelina	0·817
Earth-nut	0·530	Linseed	1·000
Poppy	0 835		

The alcoholic solution of soap from oil of earth-nut becomes solid as soon as the temperature falls to 15°, but the corresponding solution of olive oil soap remains liquid.

The most constant characteristic of oil soap is its sp. gr., but the determination of the bromine absorbed is also very useful.

T. Leone and A. Longi (*Gazzetta*, xvi, 393—398), with a view to the recognition of the presence of sesame and cotton oils in cases of sophistication of olive oil, have examined the physical and chemical properties of these oils, such as the proportion of solid acids obtained on saponification, the quantity of alkali required to complete this process, the specific gravities at 100° of the oils and the resultant acids, the points of fusion and solidification of the acids, and the indices of

refraction of the oils. As a result of their examination, it follows that the quantities of solid acids and of alkali required for saponification are appreciably equal for all three oils, but the sp. gr. of olive oil at 100° is less than that of sesame and cotton oils by about 0·005, the index of refraction of the former is also somewhat less than those of the latter. But the most marked difference is observed in the points of fusion and solidification of the resultant acids, for those from olive oil melt at 24—27°, and begin to solidify at 17·5°, whilst those from cotton and sesame oils melt at 36—40°, and solidify at 34—30° and 34—32° respectively.—*Jour. Chem. Soc.*, May 1887, 535, 536.

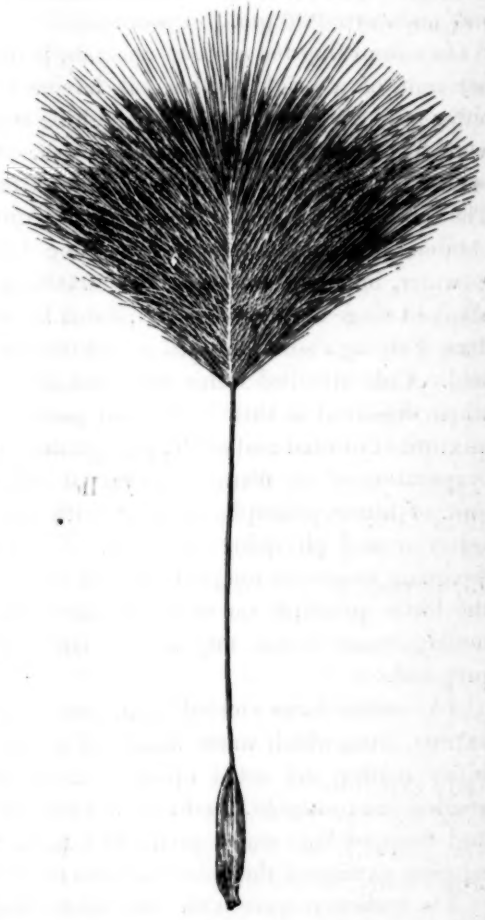
INVESTIGATIONS ON STROPHANTHUS.

From a paper by Mr. Wm. Elborne, published in *Phar. Jour. and Trans.*, March 12, 1887, p. 743, we make the following extracts:

Strophanthus was introduced by Prof. Fraser, his researches having reference to the seeds of the Kombé arrow poison (See AMER. JOUR. PHAR., 1886, p. 405). From these seeds Fraser isolated a crystalline bitter glucoside, which he named strophanthin. From Strophanthus hispidus, *DeCand.*, Hardy and Gallois subsequently isolated a crystalline bitter principle, neither of a glucosidal nor alkaloidal nature, but possessing all the toxic properties of Fraser's glucoside, which they termed strophantine (AMER. JOUR. PHAR., 1877, p. 402). The botany of the subject is by no means at present sufficiently clear to enable pharmacists to distinguish with precision the one from the other, and it appears to be questionable whether poisonous seeds, possessing undoubtedly the physiological activity described by Fraser, may be here and are not collected from species other than the two already experimented upon by the above gentlemen. Prof. Oliver has stated that the fruits entirely correspond in the two species; it is, however, generally accepted that the follicles yielding seeds with greenish-brown hairs, belong to the Kombé plant, whereas those yielding seeds with brown hairs, belong to the *S. hispidus*, and Prof. Oliver, after a more minute examination, referred the former to a distinct species which he named *Strophanthus Kombé*. This plant is described as follows by Dr. Kirk, Consul at Zanzibar:

"The plant is a woody climber, growing in the forest both of the valley and the hills, and found at various places between the coast and

the centre of the continent above the Victoria Falls and the Zambesi. The stem is several inches in diameter and rough outside. The plant climbs up the highest trees and hangs from one tree to another like a bush-vine. The flowers are of a pale yellow, and last for but a short time during the months preceding the first rains of the season. (Oct. and Nov)."



The fruit is ripe in June; the natives separate the rough epicarp and mesocarp, and dry the endocarp containing the seeds; hence the tawny appearance of the commercial follicles.

The method adopted by the natives in poisoning their arrows, is as follows: Before extracting the seed from the fruits, they dig a hole in the ground, so that they can bury the comose hair attached to the seed (for fear of its flying in their eyes), they then coarsely grind the seed, and mix it into a paste, which latter constitutes the poison with which the arrows are smeared. Game wounded by an arrow thus poisoned dies at once, seldom being able to move a hundred yards. The flesh is eaten without any evil effect accruing. The only precaution is to squeeze the sap out of a branch of the baobab tree into the wound made by the arrow, which is said to mitigate any evil effect that might result from the poison being more plentiful in the vicinity of the wound.

The drug examined by Mr. Elborne had been presented by Mr. T.

Christy, and was collected in East Africa. Mr. E. M. Holmes found it to correspond with that from Lake Nyanza, which is referred to *Str. Kombé*. The seeds of *Str. hispidus* are chestnut-brown. The hairs on the seed are quite deciduous, and the comose appendages are white. One of the pods, 12 inches in length, weighed 14·069 gm., and yielded seeds 5·99 gm. (42 per cent.); comose hair 3·119 gm. (22 per cent.), and endocarp 4·96 gm. (35 percent.)

On submitting *the seeds* to analysis, petroleum ether dissolved 20·8 per cent. of a bright yellow oil, having a tinge of green, free from bitter taste, and in a few days depositing some colorless crystals which were fusible, and on ignition left no ash. Absolute ether took up 0·9 per cent. of chlorophyll and fat, and the extract was free from bitterness. The absolute alcohol extract, after treatment with charcoal, was obtained in transparent scales weighing 1·5 per cent.; it was soluble in water, imparted bitterness to 380·000 of water, did not react with alkaloid reagents, was not precipitated by lead acetate, and did not reduce Fehling's solution until it had been boiled with dilute sulphuric acid. Cold distilled water extracted 22·5 per cent. of extract, which when dissolved in little water and poured into a large quantity of a mixture of alcohol and ether, precipitated albuminous matters, and by evaporation of the filtrate yielded an additional quantity of 2·9 per cent. of bitter principle, identical with the preceding in appearance, behavior and physiological action. The matter not dissolved by the foregoing treatment weighed 54·3 per cent. According to L. Larmuth, the bitter principle on being dissolved in water will, in a few days, undergo some change, and become far more toxic than when recently prepared.

The comose hairs yielded to absolute alcohol 0·68 per cent. of brown extract, from which water dissolved a very small amount of slightly bitter matter, not acted upon by alkaloidal reagents. The resinous residue was insoluble in ether; its alcoholic solution had a bitter taste, and dropped into water produced a beautiful blue fluorescence. The aqueous extract of the hairs was free from bitterness.

The endocarp gave with absolute alcohol 1·3 per cent. of extract, yielding with water a slightly bitter solution, free from tannin and not precipitated by Mayer's solution.

The root, freed from the cortical portion, excited sneezing when powdered, and yielded to ether 0·7 per cent. of caoutchouc-like substance; to alcohol 1·1 per cent. of an intensely bitter substance giving

the reaction for a glucoside; and to water 7·67 per cent. of a very bitter extract, which has not yet been examined.

H. Helbing (*Phar. Jour. and Trans.*, March 12, 1887, p. 747), has found the quality of the Kombé seeds to vary considerably; the best are 15 to 25 mm. long, and 4 to 5 mm. broad, somewhat rounded at the base, narrowed at the apex and prolonged into the stalk of the hairy crown, somewhat twisted lengthwise, flattened, on one side with a much more prominent keel-like ridge than on the other, of a grayish-green to brown color, and covered with appressed silvery silky hairs; 100 seeds weigh about 62 grains. Another variety of seeds is similar to the preceding in shape, but densely covered with loose, longer, silky, white hairs like a fur; 100 seeds weigh about 57 grains. The least heavy of the commercial strophanthus seeds have a dusky, dirty color, the kernel is not white, the hairs of the crown are dingy yellow, and 100 seeds weigh about 33 or 34 grains.

On drying the Kombé seed at 120° F. they lose upwards of 5 per cent. of moisture, and give with ether 32·45 per cent. of dark green fixed oil, sp. gr. ·925, and becoming brownish-red when heated on the water bath. The white strophanthus seed yielded 23·33 per cent. oil, which was a little paler in color, but otherwise like the preceding.

Mr. Helbing likewise found that the seeds freed from oil cannot be completely deprived of bitterness by the use of rectified spirit sp. gr. ·838. A tincture thus prepared is of a very pale color, has the sp. gr. ·840, and a fluid ounce of it yields about 120 mgm. of residue on evaporation. Three commercial tinctures had nearly the same density, but yielded respectively 88, 124 and 180 mgm. of residue. Four other tinctures were probably made with a weaker alcohol, were of a green or yellow color, varied between ·870 and ·900 in density, and yielded from 170 to 242 mgm. of residue.

H. D. Rolleston, B. A., (*Ph. Jour. and Trans.*, March 19, 1887, p. 761), observed that the ethereal extract of the seed gave with distilled water a solution, which on being filtered from the oil, had a bitter taste and the physiological effects of strophanthin. Similar results were obtained with the ethereal extract of strophanthus seeds prepared by different experimenters from white and green strophanthus seeds with absolute ether, showing that strophanthin is soluble in ether when the oil is present, and that the ethereal extract is not without value.

A. W. Gerrard, (*Ph. Jour. and Trans.*, May 14, 1887, p. 923), obtained from strophanthus seeds by treatment with petroleum spirit, 31

per cent. of green fixed oil, and on subsequent treatment with 84 per cent. alcohol, 52 per cent. of extract. Using upon various samples of seeds successively petroleum benzin, ether and absolute alcohol, the latter yielded 5 per cent. of extract, or considerably more than had been obtained by Elborne. The alcoholic extract may be obtained without the costly process of percolation with ether; on boiling the ground seeds with alcohol, and distilling and evaporating the tincture, about 5 per cent. of hard extract is obtained, from which the 31 per cent. of oil can be easily poured off, and adhering traces be washed away with very little ether. Elborne's results of the absence of an alkaloid, ineine, from the comose hairs are confirmed.

Strophanthin was prepared from the alcoholic extract, by dissolving it in water, filtering, adding excess of tannin, washing the gray precipitate with warm water, mixing with excess of lead acetate, drying the mixture, exhausting it with warm alcohol, removing lead by H_2S, filtering and evaporating. Thus obtained, strophanthin is pale yellowish, amorphous, readily pulverizable, burns without residue, dissolves freely in water and alcohol, and is insoluble in absolute ether or chloroform. The watery solution, when shaken, gives much froth; warmed with silver nitrate the latter is reduced; tannin causes a white precipitate; on boiling with dilute sulphuric acid glucose is produced.

Helbing (ibid. p. 924), had observed that concentrated sulphuric acid dissolves strophanthin, changing the color to dark green and finally dark reddish-brown. Minute traces of strophanthin may be detected by dissolving in a drop of water, adding a trace of solution of ferric chloride, and then a little concentrated sulphuric acid; a reddish-brown precipitate is formed which in the course of an hour or two turns emerald-green or a little darker-green, and this color remains unchanged for a long time.

Dr. F. F. Hanausek has published (*Phar. Post*, May 8, 1887, p. 301), a description of strophanthus seeds, from which the following abstract is made: Length of the seed 15 to 20 mm., width 4 mm., thickness about 1 mm., base rounded, apex attenuated to point which is prolonged into an awn almost 9 cm. long, the upper third of which is on all sides beset with delicate silky fragile hairs about 6 cm. in length. Seed yellowish-white, covered feltlike with soft silky hairs. The transverse section shows under the wrinkled testa a thin endosperm and two nearly plano convex cotyledons, the latter constituting the

greater part of the seed. The section treated with potassa shows the testa colored golden-brown, the albumen colorless, and the cotyledons greenish or canary-yellow. Concentrated sulphuric acid colors the hairs and testa golden-brown, the albumen emerald-green, and the cotyledons yellow, changing successively to greenish, bronze-colored, coppery and finally almost blood-red. It appears from the reactions that the albumen contains principally fixed oil, and the embryo besides fat also strophantin.

A false strophanthus seed has been examined by Mr. E. M. Holmes (*Phar. Jour. and Trans.*, May 7, 1887, p. 903), and shown to be the seed of Kicksia africana, *Bentham*, which grows on the Bag rooriver, at Fernando Po and at Bonny, in open low country, and is the only known African species. The seed is without awn, but is attached to the long hairy funiculus, which resembles a retrorsely hairy awn. On transverse section the cotyledons are seen to be folded or contortuplicate. Prof. Birch isolated from the seed a toxic principle, which is not a glucoside, but most likely an alkaloid. Prof. Kickx, after whom the genus is named, was director of the Botanic Garden at Ghent, and president of the Botanical Society of Belgium, and died March 20, 1887.

These seeds, as figured by T. Christy (*New Commercial Plants*, part 10), are pointed at both ends, somewhat bent, not hairy, but the retrorse hairs of the funiculus project beyond the apex of the seed.

Other strophanthus seeds are also figured and described by Christy. The seed of Str. hispidus, *DeCand.*, are smaller than Kombé seeds, dark brown, short-hairy, the bare awn rather short. Str. dichotomus var. Marckii, *DeCand.*, from Java, has the seed rounded, but narrowed at the base, dark-brown, flat, slightly bitter; bare awn short, brown, the hairy portion paler and the hairs long. The seed of an unknown species, resembles Kombé, but is larger, gray-green, has a much longer awn, and is very bitter. Another seed from the Gold Coast is pale-brown, scarcely bitter, the awn and awn-hairs rather short.

The seed of Str. Ledienii, *Stein*, (*Gartenzeitung*, 1887, p. 146; see also AMER. JOUR. PHAR., 1887, p. 269), is of the shape and size of a wheat grain, densely covered with silky yellowish-brown hairs, and at the apex provided with an awn, which is about 2 cm. long, and from its base beset with hairs, the total length of the comose appendage being about 5 cm. J. M. M.

GLEANINGS IN MATERIA MEDICA.

By the Editor.

Huechys sanguinea, a hemipterous insect, appeared recently in the London market as "Chinese cantharides." John Moss describes it (*Phar. Jour. and Trans.*, April 16, 1887, p. 845) to be from $\frac{12}{16}$ to $\frac{15}{16}$ inch long, with a vermilion-red abdomen and a dull blackish-brown thorax and wing cases. The insect has large and prominent eyes, two large vermilion cordate spots behind the head, and a keel-like protuberance of the same color between the eyes, but rather below them. It has the smell of cantharides, but did not yield cantharidin, nor could a vesicating preparation be made. The acetic ether extract, treated with carbon bisulphide, left 2.495 per cent. oily matter undissolved, which acted merely as a mild rubefacient.

Arginine is an alkaloid which has been isolated by E. Schulze and E. Steiger from the germinated seeds of Lupinus luteus, *Lin.* A hot water infusion of the dried and powdered cotyledons is mixed successively with tannin, lead acetate and lead subacetate, the filtrate freed from lead by sulphuric acid, again filtered and precipitated with phosphotungstic acid; the precipitate is mixed with lime and a little baryta; the filtrate freed from these bases by carbonic acid gas, is neutralized with nitric acid and evaporated to crystallization. The isolated base was not obtained in distinct crystals; it is easily soluble in water, insoluble in alcohol, has the composition $C_6H_{14}N_4O_2$, and readily absorbs carbonic acid forming a crystallizable carbonate soluble in water. Most of the salts are readily soluble in water, and these solutions dissolve cupric hydrate, yielding crystallizable salts containing copper and arginine. The solutions of arginine salts are precipitated by phosphoantimonic acid, phosphotungstic acid and potassio-bismuth iodide, but not by picric acid, tannin, or the double iodides of mercury or cadmium.

Besides the alkaloid the young plants contain also asparagin, glutamin, leucine, tyrosine, amido-valerianic acid and phenylamido-propionic acid, which are doubtless formed from the albuminoids.

Recently germinated blanched pumpkin plants contain likewise arginine, but in smaller proportion than the above.

Pipi root, which attracted some attention in Europe sixty years ago, and was then described by Ach. Richard, (*Jour. Chim. Méd.*, Jan. 1829), has again made its appearance in the European market, and is

referred to Petiveria hexaglochin, *Fischer*, nat. ord. Phytolaccaceæ. It is described, (*Chem. Zeit.*, 1887, p. 348,) as consisting of irregularly bent pieces, 3 to 6 mm. ($\frac{1}{8}$-$\frac{1}{4}$ inch) thick, externally gray-brown, upon transverse section showing a brownish bark with white dots, and a lighter colored radiating ligneous cord. The cork-layer consists of 3 or 4 rows of cells; the comparatively thick primary bark contains a number of enlarged cells, enclosing one or two large, or many small, crystals of calcium oxalate; the woody cord contains tracheïds with narrow dotted ducts, two-rowed medullary rays, and in the centre a thin pith. The root is recommended as an emmenagogue.

The genus Petiveria is confined to tropical America, and the shrubby or suffruticose plants are mostly acrid and have, particularly in the root, an alliaceous odor. Richard referred pipi root to Pet. alliacea, *Lin.*, and Martius (*Buch. Rep.*, 1824, xvii., p. 175), to Pet. tetrandra, *Gomez*. The root has been used internally and in baths and fomentations, as a diaphoretic, stimulant, expectorant, anthelmintic, and in fevers, toothache and gonorrhœa.

VARIETIES.

Boracin.—Dr. Thornton Parker states that this compound consists of boric acid, glycerin, methyl salicylate, menthol, thymol and eucalyptol. Used in solution, it is a satisfactory dressing for wounds; as a thick paste it is well adapted for the treatment of chronic ulcers of the legs. In the form of suppositories made with glycerin, and containing 55 per cent. of boracin, it forms a convenient method of treating threadworms or chronic leucorrhœa, while an ointment of it has given excellent results in the treatment of chronic eczema of the scalp.—*Quart. Review*, April, 1887.

Action of bitters.—From experiments performed recently in St. Petersburg, Prof. Botkin asserts:

1. That bitters diminish the digestive power, and retard digestion; they diminish the quantity of peptones.

2. That bitters diminish the secretion of the gastric juice. If they produce a feeling of hunger, it is only by irritating the gastric mucous membrane.

3. Bitters have no influence upon the secretion of the pancreatic juice or the bile.

4. Bitters not only do not diminish, but actually promote fermentation in the contents of the stomach.

Conclusion. The bitters are not of any use in the treatment of disorders of digestion.—*L'Union Médicale du Canada.*

EDITORIAL DEPARTMENT.

The Pennsylvania State Pharmaceutical Examining Board held its first meeting at the Lochiel Hotel, Harrisburg, July 12th, and organized by the election of Alonzo Robbins, Philadelphia, as president; Harry B. Cochran, Lancaster, as secretary, and Fred. H. Eggers, Allegheny City, as treasurer. The necessary preparations were made for active operations. Notice of the time for registration will be given through several newspapers, and blank forms of application for registration will be mailed, with a copy of the law, to every druggist in the State whose address is known. The first examination will probably be held in the fall.

American Pharmaceutical Association.—The Committee of Arrangements for the next meeting, to be held in Cincinnati, September 5th, has completed all the preliminary arrangements. To secure the *reduction of railroad fare* members must pay full fare going, purchase the ticket not earlier than September 2d, and obtain from the ticket agent a certificate to that effect; attendance at the meeting having been certified to by the secretary of the association, return tickets over the same route may be obtained, at one-third the highest limited fare, within three days after adjournment, and such return tickets will be for continuous trips without stop-over. Arrangements for traveling parties from Boston have been made by Mr. J. W. Colcord, Lynn, Mass., and from New York by Mr. T. J. Macmahan, New York city.

The *Headquarters* will be at the Grand Hotel, but arrangements for good accommodations have been made with several hotels, and a blank slip will be mailed by the local secretary, Mr. G. W. Voss, who will secure rooms upon its return. The hotel rates are: Grand Hotel, Gibson House, and Burnet House, $3; Palace Hotel. $2 to $2.50; St. James Hotel and Dennison Hotel, $2. European plan: St. Nicholas, $1.50 and upwards, and Hotel Emery, $1.

The committee was unable to obtain exhibits enough for a successful exposition, and no arrangements for such have, for this reason, been made.

The *entertainments* contemplated are a reception and promenade concert at the Grand Hotel on Tuesday evening Sept. 6th, tendered by the druggists of Cincinnati; Wednesday evening a vocal, instrumental and organ concert at Music Hall, under the auspices of the Apollo Club, comprising 40 male voices; Friday, carriage drive through the city and suburbs, visiting Eden Park, the West Museum of Art, Walnut Hills, Avondale, Clifton and the Zoological Garden, where a banquet will be held. If desired, members may leave for home by evening trains. Visiting ladies will be entertained by the local Committee of Ladies.

The following *excursions* have been provided for from Cincinnati: To the Mammoth Cave, at 8.15 A. M., or 8 P. M., in 9¼ hours; round trip, $13.75—for 25 or more $7.85; hotel $3 per day; cave, short route (8 miles) $2; long route (16 miles) $3; suitable reduction to a party.—To High Bridge on the Cincinnati Southern R. R., round trip $5—; for five or more $3—and on Sundays $2.—To Findlay, Karg Gas Well, having a capacity of over 15 mil-

lion cubic feet per day, and other wells over 8 million cubic feet; for parties of ten or more the round trip for one fare.—To Dayton Soldier's Home, for ten or more $2.50 the round trip.

Poisoning by chromate of lead.—Startling developments were recently made in Philadelphia, after a physician had traced several cases of lead poisoning to the buns eaten by the patients, or rather to the egg-color used by the baker to give a rich appearance to his cakes and buns. The baker, Palmer, himself was suffering from the same cause, likewise his wife, while his first wife and six children had died presumably from the effects of this poison. Eleven fatal cases have been ascertained, and an inquest having been held on four of the victims, the use of chrome yellow as an egg color was proved; also the presence of lead in the viscera determined by chemical analysis. The verdict was in accordance with the facts proven, and the baker was held to await the action of the grand jury. Suits to recover damages for sickness and death have also been entered against several parties charged with adultering and selling adulterated articles of food and with selling poisonous coloring-matter. The full extent of these criminal adulterations is as yet not known; but it has been asserted that chrome-yellow had been used by a number of bakers, noodle manufacturers and confectioners. Many of the products sold by the latter are required by the public to be of bright colors, for which, however, non-poisonous substances are most likely employed to a much larger extent. In fact it is to be hoped that a full investigation may show that the fraudulent use of poisonous coloring matter is the rare exception, and not the general rule.

OBITUARY.

Professor Jean Baptiste Joseph Boussingault died in Paris, May 12th. He was born in 1802, devoted himself in his studies chiefly to chemistry and mineralogy, and subsequently traveled for several years in the northern and western regions of South America. On his return to France, in 1833, he was called to the Chair of Chemistry in the College of Lyons, and a few years later accepted a call to Paris as Professor of Agricultural Chemistry, to which branch his later scientific researches were mainly devoted. The earlier volumes of the *American Journal of Pharmacy* contain a number of his papers, embracing investigations from both his fields of labor in Lyons and Paris, the latter being of particular importance and simultaneous with similar researches by Liebig, Dumas and others in physiological and agricultural chemistry.

Frederick Wolfrum died in Augsburg, May 15. He was born in Hof, Bavaria, September 22, 1818, and, after finishing his apprenticeship in pharmacy, studied for two years at the University of Munich, passing the State's examination in 1840. He established himself in business in Kaufbeuren, and

subsequently in Augsburg, where he also commenced the manufacture on a large scale of certain pharmaceutical preparations. For many years he was Presiding Director of the South German and later of the German Apothecaries' Society. He was also a member of the commissions for the elaboration of the two editions of the German Pharmacopœia which have thus far been published.

Joseph C. Kirkbride, Ph. G., a prominent pharmacist of St. Louis, Mo., and President of the St. Louis College of Pharmacy, died in that city of apoplexy May 6th, at the age of 47 years. He was an apprentice of J. C. Delacour, Camden, N. J., graduated from the Philadelphia College of Pharmacy in 1863, and entered into business in St. Louis in 1867.

Professor Carl Damian Ritter von Schroff died in Graz, Styria, June 17, in the eighty-fifth year of his age. He was born at Kratzau, Bohemia, September 12, 1802, where for two hundred years his ancestors had been practising physicians. He was educated at the classical school (Gymnasium) and at the University of Prague, and in his studies paid particular attention to the ancient languages and to natural history, besides the usual medical branches. He graduated as doctor of medicine in 1828, and at once became resident physician of the new Insane Asylum at Prague, and was for several years clinical assistant of Prof. Krombholz. In 1830 he was called to the chair of Theory of Medicine in the University of Olmutz, and in 1835 to the same chair in the University at Vienna. In 1849 he was transferred to the chair of General Pathology and Pharmacology, and occupied also the chair of Pharmacognosy, then newly created for the education of pharmacists. In the following year he was also appointed a member of the Medical Commission attached to the Department of the Interior, and subsequently of the Sanitary Council. He took an active part in the revision of two editions of the *Austrian Pharmacopœia*, and in 1865 was President of the Arrangement Committee for the celebration of the five-hundredth anniversary of the University of Vienna. In 1874 he retired from active life, and some years afterwards moved to Graz, where his son Carl is professor at the University.

Schroff wrote a very large number of essays on subjects of materia medica, embracing his investigations on the characteristics, composition and physiological action of many drugs, and various toxicological studies; those possessing chiefly pharmaceutical interest were mostly published in the Journal of the Austrian Apothecaries Society, and five or six of them were republished in a condensed form in the AMERICAN JOURNAL OF PHARMACY, 1860 to 1870. Among the larger medical works his "Pharmacology" is perhaps best known; it contains the results of Prof. Schroff's physiological studies, while his valuable "Pharmacognosy" was primarily intended for the use of pharmacists. Both these works passed through several editions. In his reports on the drugs at the Paris Exposition in 1867, and at the Vienna Exposition in 1873, will be found a large amount of information of permanent value.

The deceased was a member or honorary member of a large number of scientific societies; for nearly twenty years he was an honorary member of the Philadelphia College of Pharmacy.